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US 08/809,620 (TE20060717b)
Goulven VERNIOIS - Claims listing**- V - CLAIMS LISTING****Original filed claims****Translation of published PCT text WO 96/10207****Amended on November 04, 1999**

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CLAIMS1) ~~Space telescope comprising:~~a) ~~a first storey containing a membranous mirror and said mirror actuating and protecting devices;~~10 ~~b) a second storey located at the focal plane of the mirror and containing means for observing the image;~~~~c) a third storey located at the curvature center of the mirror, and containing means to explore the shape of the mirror;~~~~d) a accessory light device lighting the object scrutinized by the optical system;~~15 ~~e) a means to render jointly the three storey and the accessory light device,~~

characterized in that:

20 ~~f) the mirror and its actuating device are constituted by concentric membranes, free at their peripheries and tied by their central parts, directly or by an intermediate device;~~~~g) the membranes, or only the actuating membrane, have surface devices, conductors, insulators, and semi conductors, separed, contiguous or stacked, constituting integrated circuits, and surface electrodes, having particulaearly coils shape.~~

25 2) (canceled) Telescope according to the claim 1, characterized in that a winding centered on the optical axis of the telescope surrounds the means of uniting the three storeys at the level of the mirror storey, and/or where a wiring or a magnet with axis on same optical axis are tied to the mirror storey of said telescope.

30 3) (cabceled) Telescope according the claim 1, characterized in that the means tying the storeys is a blind cylinder (2) rigidified by tubes under pressure and by polymerization of a resin impregnating the said cylinder and tubes.

35 4) (canceled) Telescope according to claim 1, characterized in that the blind cylinder (2) tying the three telescope storeys together is placed in a protecting jacket (3).

5) (canceled) Telescope according the claim 1, characterized in that the blind cylinder (2) and the protecting jacket (3) are first folded by telescopic invagination then by folding spokes wise and scrolled along radiuses.

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- 6) (canceled) Telescope according the claim 1, characterized in that the closed tubes associated by links to jacket (3) or to blind cylinder (2) of the telescope are folded by telescopic invagination at the same time as cylinder (2) or jacket (3), and have apertures through wich a pressurized gas can be introduced to provoke their extension.
- 7) (canceled) Telescope according to claim 1, characterized in that the blind culinder (2) of the telescope (1) and the protecting jacket (3) are slightly conical or bi-conical.
- 8) (canceled) Telescope according to claim 1, characterized in that windings symmetrically centered on the optical axis of the telescop (1) are fixed on the blind cylinder (2) at the level of the mirror storey.
- 9) (canceled) Telescope according to claim 1, characterized in that the means of folding are made of linear vertical elements associated by pairs, vertically mobile from an upper position to a low position, and integral of radial displacement means, moving continuously from a position far from the centre to a position closed to the centre.
- 10) (canceled) Telescope according to claim 1, characterized in that the means recognising the shape of the mirror, situated at the control stage and defining the optical axis of the mirror, moves inside a circle centred on the optical axis of the telescope, and perpendicularly to this axis.
- 11) (canceled) Telescope according to claim 1, characterized in that the means adjusting the mirror and its actuating membrane are gimbal or ball-joint mounted, and provided with actuators.
- 12) (canceled) Telescope according to claim 1, characterized in that the means controlling the mirror modify continuously the generating line of the mirror, while maintaining the shape of revolution of the mirror, in such a manner that at each instant exist a circle of minimum aberration centred on the optical axis and moving from the optical axis towards the outside or vice versa.
- 13) (canceled) Telescope according to claim 1, characterized in that one or several photo-electric matrices scan the circle of minimum aberration.
- 14) Telescope according to claim 1, characterized in that the mirror and its actuating membrane are made totally or partially of a material having shape memory.
- 15) Telescope according to claim 1, characterized in that, for their folding, the mirror and its actuating membrane are made quasi flat by a succession of centred distorsions, alternatately concave and convex.
- 16) (canceled) Telescope according to calim 1, characterized in that the means which unit the several storeys is a tripod pyramidal frame the

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triangular base of which is contained within a circle distinctly smaller than the mirror.

17) (~~canceled~~) Telescope according to claim 1, characterized in that the frame is made from flexible tubes having a complex annular structure comprising, going from the outside to the inside :

- a) a textile layer for absorbing the solar radiation,
- b) an insulating layer,
- c) a textile layer impregnated with a resin curing under temperature or under the effect of a gas,
- 10 d) an axothermic coating reacting under effect of a gas.

18) (~~amended~~) Telescope according to claim 1, characterized in that the membranes constituting the mirror and the actuating mmebrane are obtained by <depositing a substance> on a liquide contained in a <vertical> container roteting around <its> vertical axis.

15 19) (~~amended~~) Telescope according to claim 1, characterized in that the membranes have peripheral and/or central flanges <shaped on the walls of the container>.

20) (~~canceled~~) Telescope according to claim 1, characterized in that electrodes centered on the axis of rotation of the container create an electric fild distorting the shape of the surface of the rotating liquide.

21) (~~canceled~~) Telescope according to claim 1, characterized in that a ferroelectric substance exist in the bottom of the container.

22) (~~canceled~~) Telescope according to claim 1, characterized in that an accessory light device is located on the optical axis of the system, at the level of mirror storey.

23) (~~canceled~~) Telescope according to claim 1, characterized in that a second convex semi transparent parabolic mirror the axis of which is the same as the axis of main mirror, the convex part of which is oriented towards the main mirror, and its virtual focus confounded with the real focus of the main mirror.

24) (~~canceled~~) Telescope according to claim 1, characterized in that the secondary mirror is made from a parallel faces parabolic diopter the convex face of which is a semi-reflecting coating.

25) (~~canceled~~) Telescope according to claim 1, characterized in that a third parabolic mirror, the axis of which is the same as the optical axis of the main mirror, the convex part of which is oriented towards this main mirror, has its focal point confounded with the one of said main mirror, or very slightly more distant from this said main mirror.

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- 26) (canceled) Telescope according to claim , characterized in that the means receiving the image formed by the main mirror is a CCD transparent or semi transparent matrix able to receive on its back a luminous signal
- 27) (canceled) Telescope according to claim 1 and 26, characterized in that a second CCD matrix is put on the back of the first, when this is opaque.
- 28) (canceled) Telescope according to claim 1, characterized in that one spherical concave mirror is tied to one of the storey, and in that the curvature center of this mirror is located in another storey.
- 29) (canceled) Telescope according the claims 1 and 28, characterized in that there are two or several mirrors of the claims 28, symmetrically located around the optical axis of the space optique system.
- 30) (canceled) Telescope according to claim 30 characterized in that a cut band filter protects the image-receiving photo-electric matrix from the laser beam crossed the secondary semi-transparent mirror.
- 31) (canceled) Telescope according the claims 1 and 23 characterized in that the centre of the secondary mirror is totally reflecting onto a surface which is the projection of the surface of the photo-electric image-receiving matrix on the surface of the mirror.
- 32) (canceled) Telescope according the claim1 characterized in that a large size circular screen, perpendicular to the optical axis of the telescope, and centered on this axis, is located beyond or on the side of the sagittal analyser, and in the later case has in its centre an annular hole of the same size as the said sagittal analyser.
- 33) (canceled) Telescope according to the claim 1, characterized in that a photo-electric matrix, preferably a portion of a concave sphere, is placed slightly beyond the theortical sagittal segment of the main mirror, centred on the theoritical optical axis of the telescope, its concave side turned towards the sagittal segment, and its centre of curvature being preferably at the middle of the sagittal segment.
- 34) (canceled) Telescope according to claim 1, characterized in that a movable opaque screen perpendicular to the optical axis of the telescope, having in its central portion a hole situated on this optical axis, and moving in parallel with said optical axis in shch a way that the central hole scans the sagittal segment.
- 35) (canceled) Telescope according to claims 1 and 28 characterized in that the face of the screen turned towards the main mirror is covered with a photo-electric matrix.
- 36) (canceled) Telescope according to claims 1 and 28 characterized in that the movable screen is replaced by several stacked polarized cells, all of them

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having in their center an inactive zone, these cells being successively activated in such a way as to simulate the displacement of the screen.

37) (canceled) Telescope according to claims 1 and 25 characterized in that the spherical matrix has a central hole in which is placed a cylinder the axis of which is the same as the optical axis, and which is mobile along this axis, and having at the end which is turned towards the sagittal segment, a photo-electric matrix.

38) (canceled) Telescope according to claim 1, characterized in that, in the case of an open frame, protecting parabolic membrane, constituted of resin impregnated fibers, having peripheral flanges exceeding flanges of the actuating membrane and mirror, are located beyond the said actuating membrane.

39) (canceled) Telescope according to claim 1, characterized in that hearth bound telescope mirror is free at its periphery and electrically connect at a rigid support by its central flange.

40) (canceled) Telescope according to claims 1 and 41, characterized in that the actuating membrane is applied onto the surface of a rigid support, or constitute the superficial layer of this rigid support.

41) (canceled) Telescope according to claims 1 and 41, characterized in that annular covers fitted with inside surface devices electrically linked with the rigid support, are laid onto the centre and periphery of said rigid support, said covers covering the periphery and the centre of the mirror.

42) (canceled) Telescope according to claims 1 and 41, characterized in that a cylindrical jacket, made of soundproofing materials, closed at its upper end by an optical membrane that close it.

43) (canceled) Telescope according to claim 1, characterized in that the envelope and the jacket are made of two separated elements, the upper cylindrical element, open and comprising the focal storey and the centre of curvature storey, and the lower cylindrical element, closed at one end and comprising the mirror storey.

11/04/99 Amendments CLAIMS (TE991015)

Working document

1 (amended). Optical device comprising a mirror and a device actuating the mirror,

characterized in that the mirror and the actuating device are independent concave membranes (called membranous mirror and actuating membrane).

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14 (amended) - Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are made totally or partially of a material having shape memory.

5 15 (amended)- Optical device according to claim 1 characterized in that, for their folding, the concave actuating membrane and the concave membranous mirror are made quasi plane by the formation of concentric circular undulations obtained by a succession of centred distorsion alternately concave and convex, and the quasi plane one thus obtained rolled up on itself according to a diameter.

10 18 (amended)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are obtained by material deposit on a liquid contained in a container rotating around a vertical axis.

19 (amended)- Optical device according to claim 1 characterized in that the membranous mirror and the actuating membrane have central and/or peripheral flanges

15 44 (new)- Optical device according to claim 1 characterized in that the distance between the actuating membrane and the membranous mirror is monitored permanently by capacitive coupling between said actuating membrane and said membranous mirror.

11/04/99 CLAIMS (TE991015)

20 1 (amended). Optical device comprising a mirror and a device actuating the mirror, characterized in that the mirror and the actuating device are independent concave membranes (called membranous mirror and actuating membrane).

25 14 (amended)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are made totally or partially of a material having shape memory.

15 (amended)- Optical device according to claim 1 characterized in that, for their folding, the concave actuating membrane and the concave membranous mirror are made quasi plane by the formation of concentric circular undulations obtained by a succession of centred distorsion alternately concave and convex, and the quasi plane one thus obtained rolled up
30 on itself according to a diameter.

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18 (amended)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are obtained by material deposit on a liquid contained in a container rotating around a vertical axis.

19 (amended)- Optical device according to claim 1 characterized in that the membranous mirror and the actuating membrane have central and/or peripheral flanges

44 (new)- Optical device according to claim 1 characterized in that the distance between the actuating membrane and the membranous mirror is monitored permanently by capacitive coupling between said actuating membrane and said membranous mirror.

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07/12/06 Amendments CLAIMS (TE20060526)
Working document

1 (twice amended)- Telescope optical device comprising a mirror and a device actuating the mirror,

characterized in that the mirror and the actuating device are independent concave free concave membranes (called membranous mirror and actuating membrane) without contact between them, or with an other device, free at their peripheries and tied by their central parts to the telescope..

14 (canceled)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are made totally or partially of a material having shape memory

18 (canceled)- Optical device according to claim 1 characterized in that the actuating membrane and the membranous mirror are obtained by material deposit on a liquid contained in a container rotating around a vertical axis.

19 (canceled)- Optical device according to claim 1 characterized in that the membranous mirror and the actuating membrane have central and/or peripheral flanges

44 (canceled)- Optical device according to claim 1 characterized in that the distance between the actuating membrane and the membranous mirror is monitored permanently by capacitive coupling between said actuating membrane and said membranous mirror.

45 (new) - Telescope optical device according to claim 1,
characterized in that there are two levels of control to give at the free membranous mirror a perfect shape :

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In a first level, an approximate shape is given to the free actuating membrane by interaction of a magnetic fields tied to the telescope with magnetic fields generated by actuating membrane;

5 in a second level, a perfect form is given to the free membranous mirror by electrostatic interaction of the free actuating membrane with the free membranous mirror.

46 (new) - Telescope optical device according to claim 1.

characterized in that by use of the capacitive coupling between the conductive layer of the mirror and specific electrodes of the actuating membrane, the spread electronic integrated in the actuating membrane acts for the self-stabilisation of the shape of the system mirror--
10 actuating membrane

47 (new - 15 twice amended) - Optical device according to claim 1 characterized in that, for their folding, the concave actuating membrane and the concave membranous mirror are made quasi plane by the formation of concentric circular undulations obtained by a succession of centred distorsion alternately concave and convex, and the quasi plane one
15 thus obtained rolled up on itself according to a diameter> for its folding, the concave membranous mirror is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the membranous mirror in a circular surface comprising a series of circular centered waves whose the vertical crest to crest distance is so small as one
20 wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

48 (new - 15 three amended) Optical device according to claim 1 characterized in that, for their folding, the concave actuating membrane and the concave membranous mirror are made quasi plane by the formation of concentric circular undulations obtained by a
25 succession of centred distorsion alternately concave and convex, and the quasi plane one thus obtained rolled up on itself according to a diameter for its folding, the concave membranous actuating membrane is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the membranous mirror in a circular surface
30 comprising a series of circular centered waves whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

07/12/06 CLAIMS (TE20060526)

35 1 (twice amended)- Telescope optical device comprising a mirror and a device actuating the mirror,

characterized in that the mirror and the actuating device are free concave membranes without contact between them, or with other device, and tied by their central parts to the telescope..

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Goulven VERNOIS - Claims listing**45 (new)** - Telescope optical device according to claim 1,

characterized in that there are two levels of control to give at the free membranous mirror a perfect shape :

5 In a first level, an aproximate shape is given to the free actuating membrane by interaction of a magnetic field tied to the telescope with magnetic fields generated by actuating membrane;

in a second level, a perfect form is given to the free membranous mirror by electrostatic interaction of the free actuating membrane with the free membranous mirror.

46 (new) - Telescope optical device according to claim 1,

10 characterized in that by use of the capacitive coupling between the conductive layer of the mirror and specific electrodes of the actuating membrane, the spread electronic integrated in the actuating membrane acts for the self-stabilisation of the shape of the system mirror--actuating membrane.

47 (new - 15 third amended) - Optical device according to claim 1,

15 characterized in that, for its folding, the concave membranous mirror is deformed by the formation of concentric circular ondulations obtained by a succession of centered distorsions alternately concave and convex, altering the pure concave surface of the membraneous mirror in a circular surface comprising a series of circular centered waves whose the vertical crest to crest distance is so small as one wishes, in view of the number of
20 waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

48 (new - 15 third amended) Optical device according to claim 1,

characterized in that, for its folding, the concave membranous actuating membrane is deformed by the formation of concentric circular ondulations obtained by a succession of
25 centered distorsions alternately concave and convex, altering the pure concave surface of the actuating membrane in a circular surface comprising a series of circular centered waves whose the vertical crest to crest distance is so small as one wishes, in view of the number of waves so great as one wishes.

and in that the thin almost flat object so obtained is wound onto itself, forming a cylinder.

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